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ABSTRACT

This study compared performance of seniors at 21 Montgomery County (Maryland) high schools on the Advanced Placement (AP) Tests. The schools were ranked by the percentage of college-educated adults within the school boundaries, and the ranking was compared to Advanced Placement test results (the average number of students, per 100 seniors, who scored 4 or 5 on a test). Some county schools produced an extraordinary number of students who did well on the AP exams--two to five times as many as other schools with similar demographics. Comments from interviews with AP teachers in nine of these exemplary advanced placement programs, focusing on the curriculum areas of English, computer science, social sciences, science, languages, and art, make up the bulk of the report. Successful strategies in implementing AP programs are identified, based on the comments of the exemplary programs' teachers. An appendix offers information on how a school administration or parent advocacy group might replicate the study. (DB)

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Exemplary Advanced Placement Programs:
Comparing AP Test Scores by Subject and School

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Abstract

Montgomery County is a large Maryland school district (120,000 students), with 21 high schools that vary considerably in their demographic characteristics. To allow demographically fair comparisons, the schools were ranked by the percentage of college-educated adults within the school boundaries. This turned out to be a good predictor of Advanced Placement test results (the average number of students, per 100 seniors, who scored 4 or 5). Some county schools produce an extraordinary number of students who do well on AP exams--two to five times as many as other schools with similar demographics. Interviews with AP teachers in nine exemplary advanced placement programs make up the bulk of the report. An appendix offers additional details on how a school administration or parent advocacy group might replicate the study.

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Some unrecognized superstar schools emerged from a new analysis of Advanced Placement test scores in Montgomery County. These schools, along with some familiar standouts, produce an extraordinary number of students who do well on AP exams--two to five times as many as other schools with similar demographics. Here they are, according to area of excellence:

English: Rockville
Computer Science: Blair, Springbrook
Social Sciences: Poolesville, Richard Montgomery
Science: Wootton
Languages: Churchill, Einstein
Art: Whitman

AP exams are graded (by the College Board, the same organization that produces the SAT) on a scale of 1 to 5, with 5 the highest. Many colleges offer college credit or advanced standing for a 4 or 5, and partial credit for a 3. Other colleges offer full credit for a 3, depending on the subject. The exemplary programs listed above were selected on the basis of the average number of students who scored 4 or 5 during a recent 3-year period (1991-93).

The exemplary programs are listed in boldface in the adjacent table of AP test results. (The companion chart presents a broadbrush perspective.) To control for differences in school size, the table reports the number of 4s and 5s per 100 seniors at each school. Similar results are obtained if school size is measured by the total number of students rather than the number of seniors, or if the measure of school performance includes the students who scored 3.

Fair comparisons between schools are difficult in Montgomery County, because school neighborhoods are so different. In some schools, 70% of the parents have college degrees, in others only 30%. We expect to find more AP students where more parents have college degrees, and we do. In the more highly educated neighborhoods, the number of 4s and 5s per 100 seniors is four times that of the rest of the county.

So how can we tell what part of a school's success is due to effective instruction and what is due to effective parenting? One strategy is to compare only demographically similar schools. In particular, this paper compares schools with a similar percentage of college-educated adults within the school boundaries, based on the 1990 Census. The table of AP test results lists schools in that order from highest to lowest, with two exceptions. Blair's math-science magnet and Richard Montgomery's International Baccalaureate program attract students from all over the county, so these schools are listed first.

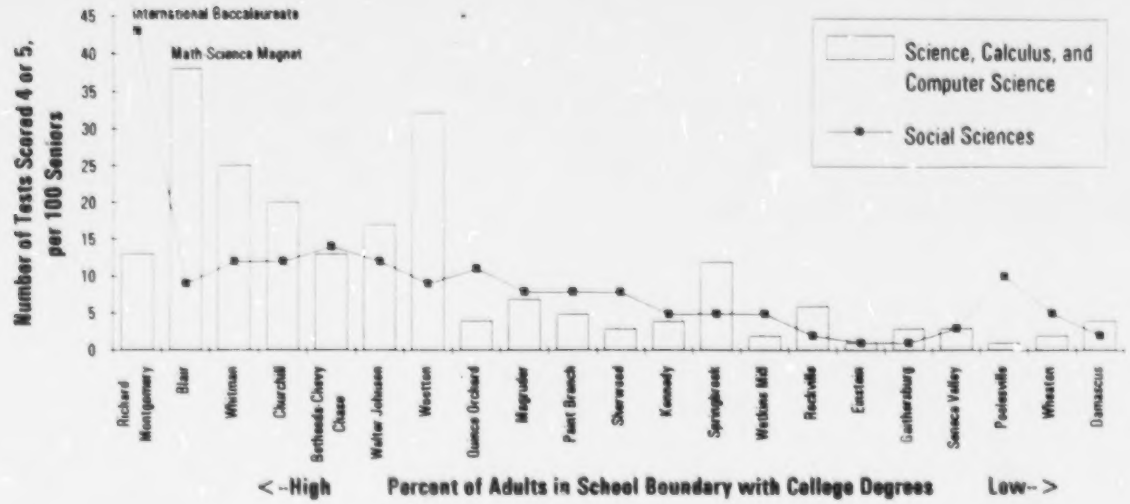
As expected, when schools are listed in this order, a number of exemplary programs emerge at a glance.

AP English at Rockville. For example, Rockville's AP English program--averaging 7 students scoring 4 or 5 per 100 seniors--produces AP achievers at twice the rate of the nine schools that rank **above** it on the demographic scale.

George King, Rockville's AP English teacher, tells students he has two objectives: 1) you will look at language more closely than you ever looked before, and 2) you will think independently. To ensure independent thinking, King does all of his teaching through questions he poses to his students. If a question doesn't get a good respone, he'll modify it and ask it differently next year. "Sometimes kids come up with unexpected ideas," he says. "When that happens, next year I'll ask a question to elicit that point of view."

Patient prodding, and a horseshoe seating arrangement for speeches and plays,

Advanced Placement Tests Show Schools Have Different Strengths



Number of Advanced Placement Tests Scored 4 or 5, Per 100 Seniors

School Size and Neighborhood Demographics			AP Subject Class							
School	Seniors in 1993	Adults with College Degree	Engl	Soc Sci	Calc	Comp Sci	Sci	Lang	Art	Music
Richard Montgomery	330	46%	8	**43**	5	1	7	8	0	0
Blair	472	43%	7	9	8	**14**	16	2	0	0
Whitman	340	72%	9	12	10	0	14	3	**4**	0
Churchill	363	71%	10	12	10	2	8	**9**	1	0
Bethesda-Chevy Chase	302	65%	8	14	7	1	5	5	0	0
Walter Johnson	286	64%	4	12	3	0	14	2	2	0
Wootton	357	64%	3	9	6	1	**25**	3	0	0
Quince Orchard	462	53%	3	11	2	0	2	1	0	0
Magruder	302	50%	3	8	3	0	4	1	0	0
Paint Branch	327	48%	2	8	1	0	4	1	0	0
Sherwood	321	48%	4	8	1	0	2	0	0	0
Kennedy	303	46%	2	5	2	0	2	0	0	0
Springbrook	388	46%	4	5	4	**4**	5	2	0	0
Watkins Mill	325	45%	3	5	1	0	1	1	0	0
Rockville	224	42%	7	2	3	0	3	1	0	0
Einstein	257	41%	4	1	0	0	1	**4**	0	0
Gaithersburg	312	39%	2	1	1	0	2	0	0	0
Seneca Valley	285	39%	3	3	1	0	3	0	0	0
Poolesville	61	38%	2	**10**	1	0	1	0	0	0
Wheaton	287	34%	1	5	0	0	1	0	0	0
Damascus	234	32%	3	2	1	0	3	0	0	0

Blair's math-science magnet and Richard Montgomery's International Baccalaureate draw students countywide, so are listed first. Other schools are listed by percent of adults within the school boundary who have a college degree, based on the 1990 Census. The data for each AP Subject Class is an average of several AP subjects over a 3-year period, 1991-93. Data for individual AP subjects are available from John Hoven (301-593-1702).

encourages even shy students to participate. In fact, King's students teach the 18 poems that make up his poetry unit. They also use the Socratic method, with King as an enthusiastic participant. His AP classes are 50% minority, a mix that he says adds to the discussion.

To get his students to look closely at words, King has them translate Chaucer's **Canterbury Tales** from the Middle English. They learn the origin of words, he says, and how to read between the lines for clues about Chaucer's characters.

King wishes that AP teachers had more opportunities to observe each other in the classroom. He'd enjoy giving an in-service course in AP English where he'd teach a unit the same way he teaches the kids. King's principal, Dr. Edward Shirley, also valaues these opportunities. Last year, he organized seven sessions for Rockville's AP teachers to share techniques--teachers of English, calculus, and European history all pooling their ideas on what works.

After 20 years of teaching AP English, King still asks his students for a detailed end-of-year evaluation: 1) Did the course fulfill its stated objectives? 2) Did the course fill your objectives? 3) Were you prepared by the course for the AP exam? 4) What single work of literature did you enjoy the most? The least? 5) What unit was the most profitable? Least profitable? 6) Can you suggest any ways the course could be improved? 7) How was the course more or less valuable than other English courses? 8) Additional comments:_____.

Computer Science at Springbrook and Blair. Springbrook's AP computer science program--averaging 4 students scoring 4 or 5 per 100 seniors--produces AP achievers at seven times the rate of the schools that rank above it on the demographic scale. Only the highly selective Blair math-science magnet does better than Springbrook, averaging 14 students scoring 4 or 5 per 100 seniors. (The Blair magnet admits 100 students per grade out of 10,000 countywide.)

Jim Haber, Springbrook's AP computer science teacher, has a teaching philosophy that seems diametrically opposite to George King's. He says, "I don't expect my students to do anything they haven't seen me do." First the class does everything together, then the students just type in the computer code, and finally they write their own program specifications and code. "Students end up in a place where they have great independence and even a questioning attitude," he says.

Haber praises the AP exam, which he says is written with great subtlety, demanding excellent judgment on the part of the student. He rejects the suggestion that a successful AP computer science program requires state-of-the-art computers. "You absolutely can teach with less computer power," he says. "In fact, it may work better, because the kids learn to be more careful."

Blair produces two-thirds of the county's AP achievers in computer science. Magnet students learn the preprequisites in an accelerated program, and are joined by nonmagnet students for the final two semesters (data structures and analysis of algorithms).

Susan Ragan, Blair's AP computer science teacher, says that the necessary elements of a successful AP computer science program are 1) a teacher with the desire to make it go, 2) a base of students who have the prerequisites (Pascal and Pascal Plus), and 3) a supportive principal--especially early on, since new electives attract few students at first.

Keeping up a computer science program means keeping up with the pace of innovation. In 1998, the College Board is switching the AP Computer Science curriculum to the C++ computer language. So Ragan is sitting in on a teacher's class in C++, trying to keep up with the homework and attend as many lectures as she can. Worse yet, C++ may require more horsepower than the aging IBM 286 computers in common use in the county schools can supply. (Jim Haber agrees this is a concern, but feels optimistic that more powerful computers will be in place by the time teachers need them and are ready to use them.)

Social Sciences at Richard Montgomery and Poolesville. In the social sciences, Richard Montgomery's International Baccalaureate program has more 4s and 5s in 10th grade than other county schools have in all grades combined. Carol Dahlberg, coordinator of the IB program at Richard Montgomery, says they prepare their students with an unusually rigorous social sciences course in 9th grade. The following year, all IB 10th graders take AP US history (with a week or two to prepare for the state-mandated exams in Maryland government). As a result, Richard Montgomery's AP US history program averages 20 students scoring 4 or 5 per 100 seniors, nearly three times as many as the next-highest school, Poolesville. (The IB also offers the county's only AP economics class.)

Poolesville is a small high school by Montgomery County standards, only 400 students, and the percentage of parents with college degrees is among the lowest in the county, about 40%. But it produces as many social science 4s and 5s as demographically similar schools three times its size. And its success rate per 100 seniors is comparable to that of schools in the most highly educated neighborhoods.

Sue Ketron started the AP US history program at Poolesville 15 years ago, relying on advice she obtained in after-school consultations with other county AP teachers and from annual AP conferences organized by the College Board. "If there's a key to my success," she said, "it's that I **love** history. The kids figure that out in week one." Ketron has 50 students in her after-school history club.

Ketron tells students and parents frankly, "I teach to the test." The AP US history test is half essay questions, so her students write one major essay a week. After the kids take the AP exam, she asks, "What was on the test that we didn't cover?" This year, there was a lot of women's history, so next year she'll emphasize that more.

Ketron's students also practice a lot of Document-Based Questions--"DBQs." Students read seven or eight short documents, and then use them to support an answer to a test question. More than just a test exercise, Ketron says of the DBQs, "This is what historians do."

Because of the volume of material AP students have to know, Ketron relies on lecture. She stops every few minutes to ask a question and get them thinking and reacting, but there's not a lot of time for creative projects or cooperative learning. After the AP exam in May, students do individual projects for the last month of school. (Some make up their own DBQs.)

Ketron wishes AP teachers had more opportunities to share ideas. Half-days for in-service training might be a time for AP US history teachers to get together, she suggests. An evening lecture by a historian might be another. Perhaps beginning teachers could co-teach a unit with another

teacher. Perhaps experienced teachers could spend a day observing each other and exchanging ideas.

Science at Wootton. Wootton's AP science program averages 25 students scoring 4s or 5s per 100 seniors, 50% more than demographically similar schools and four times the county average. Wootton is one of only three county schools that has a nontrivial number of 4s and 5s in AP physics--Wootton has 8 per 100 seniors, Walter Johnson has 5, and Blair has 3.

At many county high schools, 9th grade honor students skip lab science and go on to biology. At Wootton, all 9th graders take lab science--meaning one semester each of physics and chemistry, with lots of laboratory projects. This is the course that gets students turned on to science according to Judy Parsons, who has taught it for years. You can expect a lot from 9th graders, she says, "because they can't drive yet."

Parsons has "60 lab projects we really like" for 14-year-olds--projects like launching hot-air balloons and dropping egg containers from a second-story window. Competitions are a popular element of the course, seniors drop to by watch freshmen compete, and the walls are lined with posters of past winners. Fun projects are easier to design for physics and chemistry principles than for biology, Parsons says. She adds that 30 of her best laboratory projects are included in the new "matter and energy" course that is being introduced countywide for 9th graders.

Wootton also requires all 9th and 10th grade honors students to do a science project. Ninth graders choose a topic, do a literature search, and prepare a proposal. Tenth graders carry it out.

Wilson Bascom, head of the science department, says that Wootton's lab science generates so much excitement that 60 10th graders sign up for both biology and chemistry. In 11th grade, they take both physics and AP chemistry. In the 12th grade, he has 48 students enrolled in his AP physics course (which he has been teaching since 1979). A third of the students take AP physics as a regular, single-period class; the others stay on for a second period that emphasizes laboratory projects. Not many schools offer that second period, according to Bascom.

Languages at Churchill and Einstein. Churchill's AP languages program averages 9 students scoring 4 or 5 per 100 seniors, two to five times as many as demographically similar schools (but only slightly above Richard Montgomery). Dale Fulton, head of the languages department, says that Churchill has a tremendous number of students taking languages and suggests that a good share of the credit should go to Churchill's feeder schools, Hoover and Cabin John Middle Schools.

Judith Blitz, head of the languages department at Hoover, says that every single 7th and 8th grader takes a foreign language at Hoover, with perhaps one or two exceptions. Some students struggle with the language, and some even start over when they get to high school--but even these students get a start on learning a language, and some acquaintaince with a foreign culture. Five language classes per grade (three Spanish, two French) are "accelerated," meaning that they progress at the same pace as a high school language class. ("Regular" classes progress at half the pace.) These students will have six full years in the language before they take the AP exam as Churchill seniors.

Einstein's AP languages program averages 4 students scoring 4 or 5 per 100 seniors, eight times as many as demographically similar schools. In French,

no school in the county surpasses Einstein. (Richard Montgomery is tied.)

Students speak only French in Christine Richardson's AP French class at Einstein. Class time is for listening and speaking, she says. (Reading and writing is homework.) Her students do skits, play games, debate, discuss literary works and current events, and listen to the French evening news she taped the night before--two or three different activities a day for upper-level students, five or six for lower-level students. They use French to communicate, not just for exercises, and are astounded to discover that some college French professors discuss French literature in English.

Richardson, a veteran with 30 years' experience, says she learned how to teach by trying many different activities, discarding those that don't work well, using those that permit the maximum student interaction, sharing with other teachers, and attending professional conferences.

Art at Whitman. Whitman and Walter Johnson are the only two county schools with a nontrivial number of 4s and 5s in studio art--Whitman has 4 per 100 seniors and Walter Johnson has 2. (Churchill stands out in art history.)

Walt Bartman, Whitman's AP art teacher, says, "The AP is an easy exam." That's deceptive. Before they take the exam, his students have spent four years immersed in an art program where students draw thousands of visitors to a year-end art festival, sell their work in one-man shows (at Bartman's art gallery in Glen Echo), and paint in the snow, in the rain, and at night (to experience abstractions, Bartman says).

Bartman is himself a producing artist as well as a teacher of 25 years' experience. He says he asks students for quantity, not quality. "I don't grade individual artwork. If a student does everything I ask, he gets an A." Well, yes. When a student brings in his artwork, Bartman evaluates it, and asks him to bring it back again. The emphasis on quantity means that students are asked to "do as many lines and colors as you can, do your portrait at age 98, look into a glass object filled with water"--and quality begins to emerge.

Most colleges don't offer college credit for the AP art exam, Bartman says. But it still serves two good ends: it helps juniors get their portfolios organized for college admissions, and it gives Bartman an opportunity to see how his students' work is judged by others.

The APEX ("AP Extended") Program at Walter Johnson. Next fall, a select group of 25-35 freshman at Walter Johnson will enter an ambitious experiment in Advanced Placement instruction. Frank Masci, Walter Johnson's principal, says that his goal is to have these students complete at least 6-8 AP classes by the time they finish high school.

An important element of his strategy (still in the planning stage) is to revise the Montgomery County course sequence for these students. In social sciences, the usual sequence is US history (grade 9), national, state and local government and contemporary issues (grade 10), modern world history (grade 11), and an elective (grade 12). The proposed APEX sequence will be modern world history (grade 9), AP US government & politics and comparative government & politics (grade 10), AP US history (grade 11), and (optional but recommended) AP European history (grade 12). The APEX modern world history will include writing and research skills to prepare students for the AP classes they will take beginning in 10th grade. As in Richard Montgomery's IB program, preparation for

the 10th grade Maryland government exam will be a brief distraction rather than a one-semester course.

In mathematics, the usual honors-level sequence is geometry (grade 9), algebra 2/trigonometry (grade 10), elementary functions/analytic geometry (grade 11), and AP calculus (grade 12). Masci proposes advancing this sequence by one year, starting with geometry in grade 8 or summer school, and ending with a second year of calculus in grade 12.

In science, APEX ninth-graders will take honors biology and (optionally) honors chemistry. (Chemistry requires concurrent enrollment in algebra 2/trigonometry, one reason for the advanced math sequence.) In grade 10, they will take AP biology, AP chemistry, or honors physics. In grade 11 and 12, AP science courses are electives.

In English, APEX students will take either AP English language and composition in grade 11 or AP English literature and composition in grade 12, or both.

Summary and Recommendations. We need to find out what works. County schools differ in their effectiveness of instruction, and the differences are dramatic. In their areas of strength, more effective schools produce twice as many high-achievers as less effective schools--sometimes three to five times as many.

What explains these differences? What have these highly effective schools learned that other schools might emulate? Depending on the subject, two factors seem most influential: 1) outstanding teachers, and 2) well-designed programs.

Not surprisingly, outstanding teachers tend to be impassioned about their subject, to hold strong views about how it ought to be taught, and to have many years of teaching experience (except in computer science). But what, specifically, do these teachers do that other teachers might emulate?

The answer to that question seems to vary considerably by subject, and perhaps also by personal inclination--what works for one teacher might not work for another. It's clear, though, that these teachers believe good teaching can be learned from other good teachers. They attend College Board AP conferences, look for opportunities to share teaching ideas, and wish there were more opportunities to get together with their colleagues.

- **Recommendation One.** MCPS should facilitate opportunities for Advanced Placement teachers to learn from each other. These opportunities could include in-service half-days, substitute time for teachers to observe other teachers, opportunities for less experienced teachers to co-teach a unit with more experienced teachers, videotaping, and sponsorship of College Board AP conferences.

There may be other payoffs from a more systematic effort to identify successful teaching strategies. The interviews in this report do little more than suggest the potential benefits. A more systematic effort ought to include interviews and observation of a number of teachers, including average teachers and less successful ones (what are they not doing?), and it should probably be carried out by an AP teacher. Novice AP teachers already do some of this and might welcome the opportunity to get some support and share what they learn.

- **Recommendation Two.** MCPS should make a systematic effort to identify successful AP teaching strategies--for example, by inviting novice AP teachers to interview and

observe more experienced teachers and share what they learn.

Besides outstanding teachers, the other major element in the AP performance of some schools is a well-designed program. The Blair math-science magnet and Richard Montgomery International Baccalaureate are conspicuous examples, but Wootton's science and Whitman's art programs qualify as well, and the contribution of Churchill's middle schools in languages might be thought of in the same light. Walter Johnson's APEX program is an exciting experiment that ought to be followed closely by other county schools.

- **Recommendation Three.** MCPS has offered flexibility and modest financial support to a growing number of county schools who are seeking a distinctive academic focus. These experiments offer great promise. MCPS should continue this effort, and encourage other schools to emulate what works.
- **Recommendation Four.** MCPS should identify measures of student achievement in middle school that are useful predictors of AP success in high school. These measures could be used to identify highly effective middle schools, so we can begin to learn what works at that level.

Finally, before one can identify successful strategies, one must be able to identify success. Generally speaking, one cannot simply compare average test scores from one school to another because neighborhood demographics are so different. This report achieved fair comparisons through the use of Census data on the percentage of college-educated adults by neighborhood. Another way might be to examine 10 or 15 years of AP data by school and look for jumps in student achievement. (It may be possible to control for changing neighborhood demographics to some degree, by using the percentage of students who receive free and reduced-price meals at each school.)

- **Recommendation Five.** MCPS should report annually by school and AP subject the number of advanced placement tests scored 4 or 5 per 100 seniors.
- **Recommendation Six.** MCPS should analyze and report time trends in Advanced Placement performance by school and AP subject, from 1980 to the present.

Appendix A. Detailed Results by Individual AP Subject

Number of AP Tests Scored 4 or 5, per 100 Seniors (1991-93 mean): Science, Math, & Computer Science

	Biology	Chemistry	Physics B	Phys Mech	Phys E&M	Calc AB	Calc BC	CompSci A	CompSci B
R. Montgomery	3	1	4	0	0	1	3	1	1
Blair	4	6	0	4	2	0	8	3	11
Whitman	6	4	0	4	0	3	7	0	0
Churchill	4	3	0	1	0	3	7	1	1
B-CC	0	4	0	0	0	4	3	0	1
W. Johnson	2	3	0	4	4	0	3	0	0
Wootton	4	7	0	7	7	0	6	0	0
Quince Orchard	0	1	0	0	0	0	2	0	0
Magruder	3	0	0	0	0	0	3	0	0
Paint Branch	2	0	0	1	0	0	1	0	0
Sherwood	1	1	0	0	0	1	0	0	0
Kennedy	1	1	0	0	0	1	2	0	0
Springbrook	2	1	0	2	0	0	4	1	3
Watkins Mill	0	1	0	0	0	0	1	0	0
Rockville	0	1	0	1	0	2	1	0	0
Einstein	0	0	0	0	0	0	0	0	0
Gaithersburg	1	1	0	0	0	0	0	0	0
Seneca Valley	2	1	0	0	0	0	0	0	0
Poolesville	1	0	0	0	0	0	1	0	0
Wheaton	1	0	0	0	0	0	0	0	0
Damascus	2	1	0	0	0	0	1	0	0

Number of AP Tests Scored 4 or 5, per 100 Seniors (1991-93 mean): Social Sciences and English

	US hist	Euro hist	Microecon	Macroecon	US Gov	Comp Gov	Psych	Engl Lang	Engl Lit
R. Montgomery	20	7	7	8	0	0	1	0	8
Blair	2	5	0	0	0	0	3	0	7
Whitman	6	5	0	0	0	0	0	0	9
Churchill	5	4	0	0	0	0	2	7	3
B-CC	3	8	0	0	1	2	0	0	8
W. Johnson	5	4	0	0	3	0	0	0	4
Wootton	3	3	0	0	1	1	1	0	3
Quince Orchard	2	3	0	0	2	2	1	0	3
Magruder	4	3	0	0	0	0	1	0	3
Paint Branch	4	2	0	0	0	0	2	0	2
Sherwood	6	2	0	0	0	0	0	3	1
Kennedy	2	4	0	0	0	0	0	1	1
Springbrook	3	0	0	0	1	0	0	1	3
Watkins Mill	2	2	0	0	0	0	1	0	3
Rockville	0	1	0	0	0	0	0	0	7
Einstein	1	0	0	0	0	0	0	1	3
Gaithersburg	1	0	0	0	0	0	0	0	2
Seneca Valley	2	1	0	0	0	0	0	0	3
Poolesville	8	2	0	0	0	0	0	0	2
Wheaton	2	2	0	0	1	1	0	0	1
Damascus	2	0	0	0	0	0	0	0	3

Number of AP Tests Scored 4 or 5, per 100 Seniors (1991-93 mean): Languages and Art

	Fr Lang	Fr Lit	Germ Lang	Sp Lang	Sp Lit	Latin	Art Hist	Art Draw	Art Gen
R. Montgomery	3	1	1	4	1	0	0	0	0
Blair	1	1	0	0	0	0	0	0	0
Whitman	1	0	0	1	0	0	0	0	4
Churchill	3	0	0	3	3	0	1	0	0
B-CC	2	1	0	2	1	0	0	0	0
W. Johnson	1	0	0	1	0	0	0	0	2
Wootton	1	0	0	2	0	0	0	0	0
Quince Orchard	0	0	0	1	0	0	0	0	0
Magruder	0	0	0	1	0	0	0	0	0
Paint Branch	0	0	0	0	0	0	0	0	0
Sherwood	0	0	0	0	0	0	0	0	0
Kennedy	0	0	0	0	0	0	0	0	0
Springbrook	1	0	0	1	0	0	0	0	0
Watkins Mill	0	0	0	0	0	0	0	0	0
Rockville	0	0	0	0	0	0	0	0	0
Einstein	3	0	0	1	0	0	0	0	0
Gaithersburg	0	0	0	0	0	0	0	0	0
Seneca Valley	0	0	0	0	0	0	0	0	0
Poolesville	0	0	0	0	0	0	0	0	0
Wheaton	0	0	0	0	0	0	0	0	0
Damascus	0	0	0	0	0	0	0	0	0

Appendix B. Replicating the Study

Advanced Placement and enrollment data. The College Board sends every school district a listing, by school, of the number of students who score 1,2,3,4, or 5 on each AP subject. Parent organizations can request a copy from the appropriate school administrator or from a member of the Board of Education. Test results fluctuate from year to year, so it's necessary to average together at least two years of data to see a stable pattern.

School enrollment figures appear in school district publications. Once the AP and enrollment data are in a spreadsheet, one can easily calculate the average number of students per 100 seniors who scored 4 or 5 in each AP subject, and aggregate the results into AP subject classes defined as follows:

English: English language and composition, English literature and composition
Computer Science: computer science A, computer science AB
Social Sciences: US history, European history, microeconomics, macroeconomics, US government and politics, comparative government and politics, psychology
Calculus: calculus AB, calculus BC
Science: biology, chemistry, physics B, physics C mechanics, physics C electricity and magnetism
Languages: French language, French literature, German language, Spanish language, Spanish literature, Latin--Vergil, Latin--Catullus-Horace
Art: art history, studio art--drawing, studio art--general portfolio
Music: music listening, music theory

Census data on the percentage of adults with a college degree. A public library is a likely source for CD-ROM census data by census tract, plus maps of Census tracts and school attendance areas. Assign census tracts to schools as best one can (precision is neither possible nor necessary). Record the total population in each census tract, and the total number of adults with a BA/BS or higher degree. Put the data in a spreadsheet and for each school attendance area, calculate the average percentage of adults with a college degree.

Interviews. Identify the AP programs that stand out, and interview the AP teacher. Interviews are a pleasure, because the teachers are articulate and the basic question is, "What specifically do you do that gives you such outstanding results?"